

REMARKS

Claims 1-40 are pending in this application, of which claim 4 has been withdrawn from consideration and claims 1, 5, 9, 13, 15, 18, 24, 25, 26 and 28-40 have been amended. No new claims have been added.

Before turning to the cited references, a brief review of the claimed invention is in order.

In the present invention, as shown, for example, in amended claims 1, 18, 38 and 39, the InP layer is wet etched by an anisotropic etchant including hydrochloric acid and acetic acid.

As shown in Fig. 7 and discussed at page 25, lines 10-23 of the original specification, the present invention is based on the inventor's realization that mixed solution of hydrochloric acid and acetic acid works as an anisotropic etchant whose etching rate in the $\langle 0-11 \rangle$ -direction is approximately 30 to 100 times higher than the etching rate in the $\langle 100 \rangle$ -direction.

Because the etching rate of this mixed solution (etchant) in the $\langle 100 \rangle$ -direction is always low, even if the etchant has a high concentration at a mask end, the surface of the InP layer can be flattened by this mixed solution without having a concave configuration.

The Examiner has maintained from the previous Office Action all of the prior art claim rejections based on various combinations of Tsukiji et al., Adachi et al., Goto, Kimura et al. and Otsuka et al.

Applicants respectfully traverse all these rejections.

On page 7 of the Office Action, the Examiner has indicated that he disagrees with Applicants' argument that "an object of the present invention is to flatten the convex structure

formed by crystal growth, which is totally distinct from teaching of Adachi et al., which disclose forming the mesa structure.” The Examiner states as follows:

First, the examiner acknowledges that Adachi does disclose a mesa structure. However, this mesa structure is identical with applicants' mesa structure (See claim 3 of the present invention). Second, there is no limitation in the claim indicate that the wet etching (HCl and acetic acid) will destroy the mesa structure (i.e. the mesa structure is no longer exist after the wet etching step). Applicants only claim the etching will flatten the surface of the InP layer. Adachi clearly teaches to use HCl and acetic acid to etch InP layer to create a flat surface for the mesa structure (See page 1054 and Fig. 4). Thus, the examiner still maintains previous 35 USC 103 rejections. [Sic.]

In response, Applicants submit the following argument.

In Tsukiji et al., the InP layer is etched by means of an etching technique using a mixed solution of fluorine and methanol or by causing melt packs in a liquid phase. (See column 3, lines 63-65). The melt packs in the liquid phase are well known as isotropic etching.

As shown in Fig. 1-(d) of Tsukiji et al., a part far from a mask is flat and a mask end has a concave configuration. This indicates a result of the etching using an isotropic etchant. In isotropic etching, the etchant not consumed for the mask is supplied to an edge of the mask so as to have a high concentration and, therefore, an etching rate at the edge of the mask becomes high. Accordingly, as shown in Fig. 1-(d), the InP layer at the mask end has the concave configuration.

The mixed solution of fluorine and methanol, mentioned at column 3, lines 63-65 of Tsukiji et al., form fluoromethanol and hydrofluoric acid. However, even if this mixed solution is used, it is not possible to obtain the etching configuration shown in Fig. 1-(d). Tsukiji et al. is

a U.S. patent claiming priority based on Japanese Patent Application No. 5-205725 (See the front page of Tsukiji et al.). This basic Japanese Patent Application discloses not a “mixed solution of fluorine and methanol” but instead a “mixed solution of bromine and methanol”. It appears that the U.S. patent to Tsukiji et al. contains a translation error. The “mixed solution of brome and methanol” disclosed in the Japanese Patent application is well known as isotropic etching.

Thus, in Tsukiji et al., the InP layer is flattened by isotropic etching. There are principle differences of etching and etchant between isotropic etching and anisotropic etching. Both of them cannot be combined. Hence, it is not possible for one skilled in the art to arrive at the present invention, in which anisotropic etching is used, from the teachings of Tsukiji et al., in which isotropic etching is used.

Adachi et al. merely discloses a combination of etchings.

Furthermore, there are no descriptions about flattening of the InP layer having a convex structure in Kimura et al. and Otsuka et al. An Fe-doped high resistivity layer 15 in Kimura et al. and a p-type InP layer 37a and an n-type InP layer 37b of Otsuka et al. are formed only by crystal growth. There are no descriptions about etching of the InP layer in Kimura et al. and Otsuka et al. Hence, it is not possible for one skilled in the art to arrive at the present invention wherein anisotropic etching is used for flattening of the InP layer from Kimura et al. and Otsuka et al. In addition, because there are no descriptions about etching of the InP layer in Kimura et al. and Otsuka et al., it is not possible for one skilled in the art to combine Kimura et al., Otsuka et al. and Adachi et al. to arrive at the present invention.

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Accordingly, claims 1, 18 and 28-40 have been amended to recite anisotropic etching, and the prior art rejections should be withdrawn.

The Examiner has indicated that claims 28-37 and 40 have been allowed.

In view of the aforementioned amendments and accompanying remarks, claims 1-3 and 5-40, as amended, are in condition for allowance, which action, at an early date, is requested.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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